THE SOVIET AGRICULTURAL TRANSFORMATION:

A GREEN REVOLUTION WITHOUT THE NAME

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Introduction

The idea of identifying a Green Revolution in the Soviet Union may seem surprising, given the country's distinct political and institutional context. Officially, no revolution other than the successful Bolshevist Red Revolution of 1917 was known to occur in that country. Any big event that happened subsequently had somehow to derive from it. By that measure the consequences for Soviet agricultural science and plant genetics were not straightforward positives. They also contained certain negative elements that hindered development of Soviet genetics science and its application in plant breeding at pace with the global trend till the 1950s. However, even in those days, one agricultural scientist managed to skilfully navigate through the challenges and initiate a wheat breeding programme in 1940. Internationally accepted standard breeding methods were used in this programme that produced amazing results toward the late 1950s. These results were no less momentous than those achieved by American plant scientist, Dr. Norman E. Borlaug. His high-yielding varieties of wheat developed in the late 1950s became the vehicle for spreading the Green Revolution in Asia and Latin America in the mid-1960s.

Pavel Panteleimonovich Lukyanenko

The name of the scientist at the heart of this story was Pavel Panteleimonovich Lukyanenko. An American professor specializing in agrarian history, Mark B. Tauger of West Virginia University presented a case for a Soviet Green Revolution based on the works of the famous Soviet wheat breeder Pavel P. Lukyanenko[1]. And indeed the parallels were striking. As it was with Japan, Italy, Argentina, Mexico in the early 1900s, scientific crop breeding in the Soviet Union was restarted to address the same issues as those countries faced – famines, occasional crop failures due to drought, dry winds, plant diseases and other factors. The ongoing civil war in the early 1920s aggravated the impact of unfavourable weather conditions on crop cultivation. In 1932-33, back-to-back failure of wheat crop due to rust diseases caused famine. As a result, yields of the staple cereal crop, wheat, were low. For example, in Kuban in southern Russia, the average yield of wheat was 0.8 t/ha in 1920 and 0.9 t/ha in 1930.

Pavel Panteleimonovich Lukyanenko was born in the village of Ivanovskaya (at present Krasnoarmeisky district in Krasnodar region) to a Kuban Cossack family on 27 May 1901. According to village elders, his name was inextricably linked with grain. He was born in a wheat field, grew up and was brought up among endless wheat fields. He also died in a wheat field. Probably his fate as someone from a Kuban Cossack village couldn't have turned out any differently, where people have always bowed down before grain crop and felt reverent respect for it. His contemporaries would say that Pavel Lukyanenko's interest in agriculture arose during his school years. Even then he started wondering why the grain harvest on the fertile Kuban land wasn't always equally abundant. In 1920, Lukyanenko served as a private in a rifle

[1] Mark B Tauger. 2017. Pavel Pantelimonovich Luk'ianenko and the Origins of the Soviet Green Revolution: The Lysenko Controversy as a Global Phenomenon, Volume 1, https://doi.org/10.1007/978-3-319-39176-2=4

regiment of the Red Army and then enrolled in the Kuban Agricultural Institute in Krasnodar in 1922[2]. He graduated from the Institute in 1926.

The beginning of Lukyanenko's scientific career

Lukyanenko decided to become a Selektsioner (селекционер), plant breeder in English, based on his certain early life experiences. When he was an adolescent, a village elder described to him the effects of a plant disease the peasants called "Zakhvat" (захват) meaning capture. It blackened wheat stems and allowed the plant to produce only depleted "empty" grain. This infestation was stem rust and this description of it was his first encounter with one of the plant diseases that would be a major focus of his plant breeding work. After graduating, Lukashenko worked at the Kuban-Black sea research institute in Crimea. In 1930 he returned to Krasnodar and joined the Krasnodar Plant Breeding Station. In 1956 it was upgraded into the Krasnodar Agricultural Research Institute widely known by its Russian acronym КНИИСХ (Краснодарский Научно-Исследовательский Институт Сельского Хозяйства). He was appointed senior research scientist (старший научный сотрудник) and led the group responsible for breeding winter wheat.

The beginning of Lukyanenko's breeding experiments in Krasnodar coincided with consecutive crop failures during 1931–1933 caused by environmental factors. The most significant was a vast and severe outbreak of rust diseases. In Ukraine it affected up to 70 percent of wheat harvests in 1932. According to estimates by Western specialists, because of the outbreak of rust infestation in 1932, wheat yields even in Western Siberia decreased by about 20 percent. A Soviet agronomist, P.K.Artemov, estimated the loss of wheat harvests in 1932 at 9 million tonnes. In an important study on rust infestations in the Northern Caucasus in 1932, Lukyanenko estimated that leaf rust destroyed at least 25 percent of the winter harvest in Kuban alone, the top wheat growing region in the USSR. This infestation was caused by emergence of a new race of leaf rust to which all existing varieties were susceptible.

Early achievements in wheat breeding

Lukyanenko set out to develop varieties of winter wheat resistant to the new race of leaf rust. He took an approach which was innovative for that period. He carefully selected parent materials for hybridization with an emphasis on distant forms of winter wheat for recombining important traits. It included intraspecific and inter-subspecific hybridization. One of the first successful hybrids was derived from crossing the improved variety "Ukrainka", a winter wheat variety (with excellent baking qualities) with the Canadian spring wheat variety "Marquis" (prized for early maturity, straw strength, disease resistance, and superior grain quality). Marquis was developed from a cross between Hard Red Calcutta (an Indian wheat variety known for its early maturity) and Red Fife (a high-quality Canadian wheat known for its milling and baking properties) through a breeding program led by Dr. Charles E. Saunders at the Central Experimental Farm in Ottawa, Canada, in the early 20th century.

[2] Many of my compatriots, including me, had an opportunity to study in that wonderful institute in the 1970s and 1980s

(In the photo: P.P. Lukyanenko)

The first hybrid that Lukyanenko developed was “Ukrainka”. It produced yields in the range 3–4 tonnes/ha, much higher than the average, and was resistant to diseases and lodging. It was developed by selection and minor hybridization of Local “Ukrainka” with the Hungarian variety “Banatka”, an awned winter wheat variety valued for its high productivity, winter hardiness and adaptability to steppe conditions. Lukyanenko selected Ukrainka as a base for its Banatka-derived traits: robust growth, yield potential , and grain quality. This variety went into production in the 1940s and was grown on several million hectares. It laid the foundation of Lukyanenko’s further breeding works. The other important variety of winter wheat that Lukyanenko developed in the 1940s was “Skorospelka 2”, which later became the parent for a crossing that subsequently led to development of “Bezostaya 1”. “Skorospelka 2” was developed by crossing the hybrid of US winter wheat varieties (Kanred X Fulcaster) with the Argentine spring wheat variety Klein 33. Skorospelka 2 was an early-maturing winter wheat with 280–300 days of growth, moderate lodging resistance, and yield of 2.5–3.5 t/ha. This variety addressed the need for quicker harvests in the Kuban region's short growing season but still had issues with shattering and rust susceptibility.

The landmark wheat variety “Bezostaya 1”

Breeding work for development of the landmark winter wheat variety “Bezostaya 1” literally meaning “awnless” started toward the end of 1940s at the Krasnodar plant breeding station under the leadership of Pavel Panteleimonovich Lukyanenko. Actually it was the culmination of Lukyanenko’s mission-oriented breeding works carried out through the 1930s and 1940s wrapped with the memory of crop failure and famine caused by devastating rust infestations of the staple wheat crop. As evident from the pedigree and breeding pathway of “Bezostaya 1” (shown in the picture), the genealogy of the variety traces back to 20 varieties of wheat including land races from England, Holland, Italy, Spain, Uruguay, Japan, Argentina, US, Canada, India, and USSR. Lukyanenko accessed all exotic wheat germplasm through N.I.

Vavilov's world collection of plant species stored at the All-Union Institute of Plant Growing widely known by its Russian acronym VIR (ВИР- Всесоюзный Институт Растениеводства).

The breeding pathway of "Bezostaya 1" is illustrated in a sequence of nine steps. Incorporation of all selected genes from ancestors transferred through step-by-step hybridization by many wheat breeders in different periods across continents started at step six. At this step, as stated above, Lukyanenko crossed Argentine variety Klein 33 with US wheat varieties (Kanred-Fulcaster) for breeding Skorospelka 2. The wheat variety Klein 33 was developed by German-born Argentine breeder Enrique Klein (1889–1970) by crossing the Italian wheat variety Ardito with a local variety Vencedor. Ardito was one of the varieties that the famous Italian plant scientist Nazareno Strampelli (1866–1942) bred in 1920 and handed them over to Argentine plant breeders for use in their breeding programmes during his visit to Argentina in 1923.

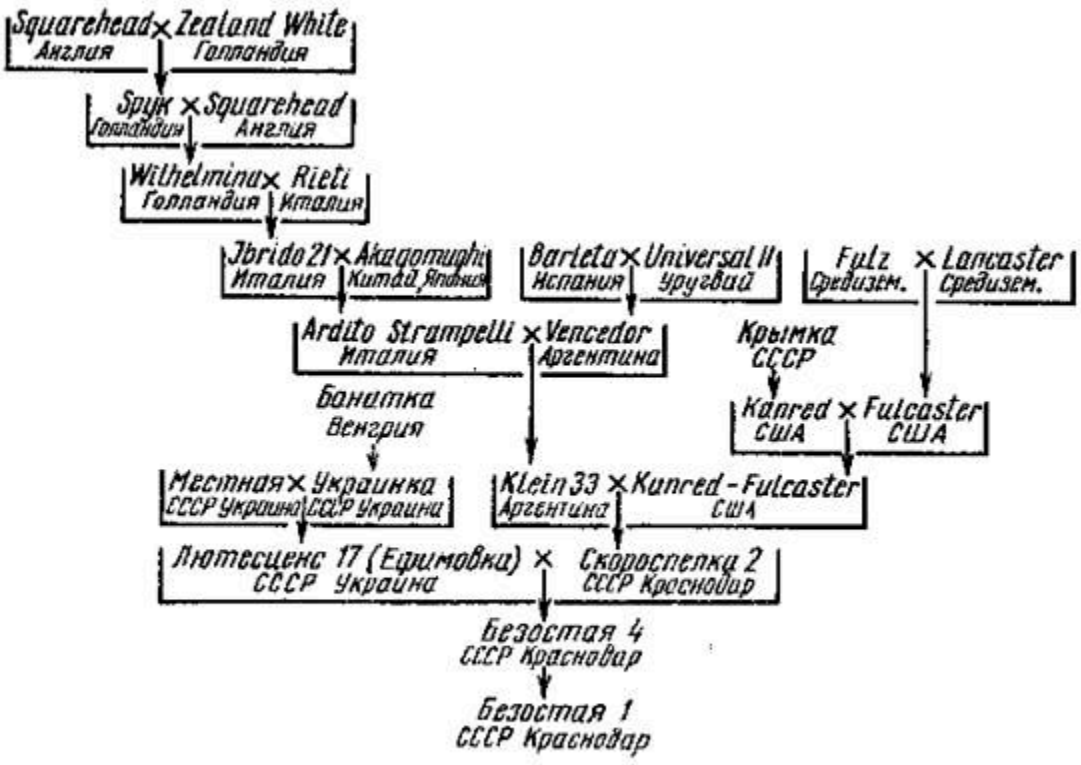

Рис. 100. Происхождение сорта озимой пшеницы Безостая-1 (составлена М. М. Якубцинером).

The variety Klein 33 was known for its resistance to wheat diseases containing the gene Lr34 conferring resistance to leaf rust and the gene Sr8b against stem rust. It had wide adaptability and could be grown as both winter wheat and spring wheat. Its female parent Ardito resulted from a cross involving European land Japanese land races – (Rieti × Wilhelmina) × Akagomugi (shown at steps 1–4). Ardito was

a historic Italian wheat variety (*Triticum aestivum*), classified as a soft red winter wheat. In essence, it was one of the first HYVs of wheat. It was a semi-dwarf, high yielding variety with resistance to lodging and excellent baking quality. Its dwarfing gene *Rht8* (reduced height) and photoperiod insensitivity gene *Ppd1* were derived from the Japanese variety Akagomugi. The wheat variety Akagomugi was developed by Eiichi Koiso, a Japanese wheat breeder in 1914. It originated from a cross between the landrace Shin-Nihonji and the Italian variety Daguso, selected for its semi-dwarf stature and red kernel color.

The direct cross that Lukyanenko made in 1946–1947 toward creating the variety "Bezostaya1" was between Lutescens 17 (also known as Edimovka) and Skorospelka 2. Lutescens 17, a spring bread wheat, is a line in the lutescens variety group belonging to the species *Triticum aestivum* L. Lukyanenko developed it as an intermediate form, likely as a hybrid by crossing with "Krymaka", a Crimean landrace. The choice of Lutescens 17 as the maternal parent was driven by its resistance to leaf rust and stem rust, awnless head and red grains, superior grain quality (gluten content 28–32 percent, protein content 14–16 percent), and adaptability to agro-climatic conditions of Kuban where it produced high yields up to 5–6 tonnes/ha under optimal conditions.

(In the photo P.P. Lukyanenko and his associates)

Following hybridization, Lukyanenko and his team conducted progeny selection in segregating populations using both individual selection and mass selection. Individual selection was done to create pure lines from the isolated elite plants. Mass selection was done to maintain economically important traits at population level. Selection was conducted over multiple generations (F1 to F6). Lukyanenko applied high selection intensity during the selection process discarding 90–95 percent of plants in early generations to work with elite plants so that only the best combination of traits were advanced. Selection was conducted with a multi-trait approach simultaneously for yield, disease resistance,

resistance to lodging, and grain quality with a careful balancing of traits. Progeny evaluation was field-based. Most selection occurred in natural field conditions with minimal reliance on laboratory tools. Lukyanenko used greenhouses or winter nurseries (e.g., in milder climates) to grow additional generations per year, reducing the breeding cycle from 10–15 years to 5–7 years. To advance ecological adaptation, selection was tailored to the Kuban region's climate, with its hot summers, variable winters, and disease pressure, ensuring the resulting variety was locally adapted.

The outcome of the cross was the variety "Bezostaya 4". It was developed at the beginning of the 1950s. This variety combined rust resistance and grain quality from Lutescens 17; winter hardiness and early maturity from Skorospelka 2; and moderate lodging resistance from the Argentine variety Klein 33. But even at F6 it was not completely stabilized and uniform providing opportunity for further selection. In the field of "Bezostaya 4" variety, Lukyanenko noticed individual plants that stood out for their increased yields, improved winter hardiness, and adaptability to various soil and climate zones (from the North Caucasus to the Central Black Soil areas). These plants were isolated through individual selection. Lukyanenko and his team selected 600 elite individuals over two years based on such criteria as heavy, compact ears (prismatic shape, 8–10 cm long, with awn-like remnants up to 2.5 cm), thick straw for lodging resistance, red egg-shaped kernels (high protein), and non-shattering behavior. Following 4-5 cycles of selection in the population of selected elite lines, Bezostaya 1 was developed in1955 and entered the breeding pipeline through the State Variety Testing Programme (государственное сортоиспытание).

Bezostaya 1: the variety that drove the Soviet Green Revolution in wheat

Bezostaya 1 is a medium-height (90–105 cm), medium-early variety with a growth period of 280–300 days. The spike is cylindrical with medium length (8–10 cm). It produces average yields of 3-4 tonnes/ha under low input conditions with potential up to 6.0 tonnes/ha under optimal growing conditions. It has high drought tolerance and medium winter hardiness. The variety has high to medium resistance to lodging and high resistance to grain shattering. The variety has durable resistance to leaf rust (*Puccinia triticina*), excellent durable resistance to stripe rust (*Puccinia striiformis*), and good field resistance to stem rust *(Puccinia graminis*). This variety is considered a strong wheat suitable for baking and producing high-quality flour. Its milling and baking qualities are excellent. The variety was officially registered in 1959 following which its commercial cultivation started. It became one of the most widely grown winter wheat varieties in the USSR. In 1971, it was grown on 8.3 million ha (about 40 percent of land under winter wheat in the USSR). It produced yields exceeding the average yields of its predecessors by 1.5 to 2 times. Cultivation of Bezostaya 1 gradually expanded into neighbouring friendly countries of Eastern Europe - Hungary, German Democratic Republic, Bulgaria, Romania, Czechoslovakia and also in Turkey.

The winter wheat variety "Bezostaya 1" was the marvel of Soviet wheat breeding. Academician Pavel Panteleimonovich Lukyanenko brilliantly realized scientific thoughts and best practices of the school of classical Russian/Soviet plant breeding founded by the great plant scientist Nikolai Ivanovich Vavilov. At the core of this breeding approach was working with a broad range of diverse genetic materials – indigenous as well as exotic. Soviet wheat breeders had access to about 40,000 wheat germplasm,

stored in the world collection of plant germplasm at the Vavilov Institute in Moscow. It was probably the largest collection in the world. In hybridization, the emphasis was on complex wide hybridization – crossing distant ecotypes and landraces, winter-type varieties with spring-types in intraspecific hybridization, interspecific hybridization, using exotic crop varieties with domesticated genes for desired traits (disease resistance, lodging resistance, adaptability, grain quality, etc.). The aim was to assemble in local genetic base materials various combinations of desired genes rather than single genes to benefit not only from additive but also from epistatic gene effects. Lukyanenko added to this his own strategy of working with intermediate populations. These populations were typically derived from crossing with advanced breeding lines, distant ecotypes and select from such population elite plants for making final crosses with the aim of developing the final variety.

The variety Bezostaya 1 gained international prominence following its evaluation in the CIMMYT-conducted International Variety Trials (1971–1972). Based on the results, Dr. Norman E. Borlaug described Bezostaya 1 as "the best genotype for many wheat areas of the world" during evaluations in the International Variety Trials (1971–1972). He noted its outstanding yield potential (up to 6.0 t/ha in optimal conditions) and broad adaptability across diverse climates and soils, from the steppes of the Soviet Union to parts of Europe, North America, and beyond. Its ability to perform well under varied management practices made it a standout in global wheat breeding. Borlaug also emphasized its role in transforming wheat production, noting that Bezostaya 1 covered over 160 million hectares worldwide by the 1980s. He saw it as a cornerstone of global wheat improvement, comparable to CIMMYT's own semi-dwarf varieties. Its success in countries like Turkey, Hungary, and Bulgaria (where it occupied up to 90% of wheat acreage) reinforced his positive assessment.

Rice

In historical Russia, the concept of food was culturally anchored in "хлеб" (bread), which functioned not merely as a staple but as a symbol of sustenance, livelihood, and social order. So, the focus of the "Green Revolution" in the Soviet Union was on wheat. But a GR-like intensification of production of another cereal crop also occurred on a regional scale with a different approach. It was rice, which wasn't a major food crop. Preconditions for this revolution were created in the early 1930s in the Krasnodar region of Russia/Soviet Union. Historically, rice wasn't a major staple crop in Russia. The word "рис" (pronounced as "ris") appeared in Russia at the end of the nineteenth century, which is a derivative of the English name "Rice". Since then its cultivation was attempted but on a very limited scale. Rice was an expensive food as it was mostly imported. Sporadic attempts to grow rice in Russia were taken from time to time.

After the 1917 Revolution, the Soviet Government took the decision to expand rice cultivation in Southern Russia which had favourable climatic conditions for rice growing. For this purpose, it created an organization called the Azov-Black Sea Rice Trust and Plavstroy, a hydro-technical construction firm, charged with the responsibility to convert lowlands of the Kuban river delta into a major rice growing area. A veteran military commander of the Civil War, D.P.Zhloba, was put in charge of this organization. The first large-scale rice sowing was carried out in 1930 in an area of 57 hectares in the Tikhovshy

village of the Krasnoarmeysky district (район) of the Krasnodar region. In those days, machinery was in short supply, so many farm operations were done manually. Shovels and wheelbarrows were the main tools. By 1931, rice had covered 1,300 hectares; by 1935, 3,600 ha.

To support rice cultivation with improved production technology and new high-yielding varieties suited to Kuban region's agro-climatic conditions, the Government took a decision to establish a rice-focused research institute in Krasnodar. Its foundation was led by the great plant scientist N.I. Vavilov. In 1929, Vavilov became the first President of the All-Union Academy of Agricultural Sciences (VASKhNIL, Всесоюзная академия сельскохозяйственных наук). In December 1931, he issued a directive to establish the All-Union Scientific-Research Institute of Rice Farming (Всесоюзный научно-исследовательский институт рисового хозяйства, VNIIRH) in Krasnodar in 1931. Vavilov appointed Academician I.D. Sokolov as first Director of the Institute. For initiation of large-scale breeding work, Vavilov handed over about 2,500 accessions of rice stored at the All-Union Institute of Plant Growing (VIR).

Following its establishment, the All-Union Scientific-Research Institute of Rice Farming went through a process of structural transformation reflecting priorities of the Soviet Government. It became the All-Union Experimental Rice Station (Всесоюзная рисовая опытная станция ВРОС, pronounced as VROS)) on 1 February 1935. In 1956, the All-Union Rice Experimental Station was reorganized into Kuban Rice Experimental Station (well known by its Russian acronym KROS, Кубанская рисовая опытная станция). In the spring of 1961, the Station was moved to the village "Belozyornoe (Russian name for white grain, rice)" located in Elizavetinskyi district (район), a major rice growing area of Krasnodar region. Finally on 20 September 1966, the Kuban Rice Experimental Station was transferred to the All-Union Academy of Agricultural Sciences (VASKhNIL). In 1966, structural reform of rice research was stabilized by converting the Kuban Rice Experimental Station into All-Union Rice Research Institute (VNIIR). Therefore, the legacy of rice research in the Soviet Union spreads through VNIIRH/VROS /KROS/VNIIR.

Scientific rice research in Krasnodar from the beginning addressed problems of rice cultivation and crop production practices, mechanization, irrigation, nutrient management and pest control. The Institute developed the first variety, Kendzo, through mass selection in a population brought from the Far East. In the early 1930s, this variety occupied most rice areas in Kuban. But there was a need for more varieties that could rapidly improve rice yields. Rice breeding in Kuban began in 1932 led by the head of the breeding programme G.G. Gushchin. In September 1936, another scientist, T.I. Dubov joined the plant breeding team at VROS. He worked in the Far East and brought with him a collection of local rice varieties such as Kenzo and Yukto (about 200 samples). At that time, the station had about 2,500 samples from the VIR. In 1937, T.I. Dubov became the head of the breeding department and continued the breeding work begun by G.G. Gushchin. In 1939, he submitted five rice varieties to the state commission: Krasnodar 3352, Krasnodar 4342, Krasnodar 3414, Italika M, and Italika M-2.

Dubov crossed Krasnodar 3352 with Biwako Moki (a Japanese variety) in 1939. The first generation was obtained a year later, and the second two years later. In September 1941, T.I. Dubov was drafted into the

Soviet Army. Another breeder, O.S. Natalina took over the breeding material and continued testing it in the breeding nursery and competitive variety trials. In 1944, from this material, O.S. Natalina submitted five varieties of rice to the state commission - VROS 3716, VROS 3856, VROS 5123, VROS 5133, and VROS 5352. She also reseeded hybrid populations, selected elite plants from them, and evaluated them. The elite plant that would later become Dubovsky 129 variety was selected in 1943 by O.S. Natalina from a fourth-generation hybrid population resulting from a cross between the Krasnodarsky 3352 variety and the Biwako Moki. In December 1948, following field testing the variety was submitted to the state commission. It was given the name "Dubovsky" in memory of the breeder T.I. Dubov, who died during the Great Patriotic War. At the same time, another variety, Kubansky 140 originating from the same hybrid population as Dubovsky 129 was submitted for state trials.

Dubovsky 129 turned out to be a breakthrough variety in the breeding work of VROS**.** It was early maturing (107 days) with an yield potential of 6.01 t/ha (demonstrated in competitive yield trials), resistant to grain shattering and blast, and moderately resistant to lodging. It was the most widely grown rice variety in the USSR. In the 1960s, it accounted for approximately 30 percent of the country's rice cultivation. In 1972, Dubovsky 129 occupied the largest area in the USSR, 66,000 hectares. In subsequent years, the area began to decline. In addition to Dubovsky 129, VROS breeders created and submitted several other rice varieties for state testing: Kubansky 140 (1949), Krasnoarmeysky 313 (1953), Krasnodarsky 424 (1954), Shirokolistny (1961), Kuban 3 (1961), Nakhodka (1963), Kuban 9 (1963), and Slavyansky 247 (1964). Of these eight varieties, four were included in the state register: Krasnoarmeisky 313, Krasnodarsky 424, Kuban 3 and Kuban 9.

The variety Krasnodarsky 424 was developed by selection from the hybrid population Krasnodarsky 3352 x Kendzo. The variety had been zoned in the Krasnodar region since 1956. In 1977, Krasnodarsky 424 occupied most rice areas, about 200 thousand hectares, with a total rice cropped area of 540 thousand hectares. The variety Kuban 3 was developed through selection from the variety Krasnoarmeisky 313. The variety Kuban 3 was next to Krasnodarski 424 in terms of cropped area under rice in Krasnodar region. Widespread cultivation of these varieties led average yields of rice in Krasnodar region to increase from 1.5–2.0 t/ha in 1935 to 3.5–4.5 t/ha in 1965, raising regional output of rice from 30,000 tonnes in 1935 to 160,000 tonnes in 1965 over the span of three decades. Average rice yield in the Krasnodar region increased 2–3 times and production increased by more than five times. As evident from the discussions on how Kuban rice breeders developed new rice varieties, the approach was centered on its own genetic materials. Exotic germplasm, including Far-Eastern, Japanese, and Indian varieties were used as parents in hybridization for transfer of desired traits – early maturity, resistance to lodging and grain shattering, resistance to cold and diseases. It was followed by mass selection in segregating populations from which elite lines were obtained through pure line selection.

In 1965–1966, the Soviet Government took steps to further intensify rice production in the Krasnodar region by building large-scale rice engineering systems comprising flood control, irrigation, drainage structures, and reclamation of marshy wetlands in the Kuban river delta for rice cultivation. A new engineering construction firm called Glavkubanrisstroy (Главкубанрисстрой) was established in 1967.

It was tasked with the responsibility of developing thousands of hectares of arable land suited for rice cultivation by draining lower floodplains of the Kuban river delta and constructing integrated irrigation and flood control infrastructure to prevent frequent flooding of the settlements along the lower reaches of the Kuban river (shown in the photo). For this purpose, it was decided to build a huge artificial water reservoir which came to be known as Krasnodar Water Reservoir or Kuban sea.

(Marshy wetlands in the Kuban river delta that were converted into rice fields)

Construction of the reservoir began in 1968. It was officially designated as an All-Union Komsomol Shock Project "Всесоюзная комсомольская ударная стройка". According to the traditional Soviet practice, this status used to be assigned to the projects of national importance to ensure they were completed timely, maintaining high quality standards and at the lowest possible cost. These construction projects also had ideological significance — they were intended to serve as an example of the communist approach to labour, meaning the commitment to working hard in the interest of the public good.

Construction of the Krasnodar Reservoir (Kuban Sea) continued for about eight years. In 1972, the Kuban River was dammed, and the reservoir began filling through the feeder canal. It was commissioned on 4 December 1975. Nearly 600,000 hectares, home to over 300,000 people, were protected from almost annual inundation by flooding in the Kuban floodplain. The reservoir covered an area of 420 km². The reservoir's total usable capacity was 23 billion cubic meters, a significant portion of which (up to 3–4 billion cubic meters annually) was used to irrigate rice fields. It created the largest rice-growing base in Europe. On February 24, 1974, the Central Committee of the CPSU and the Council of Ministers of the USSR adopted a resolution “On accelerating work on the development of the Azov floodplains to further increase rice production in the Krasnodar Territory.”
Based on this resolution, the regional CPSU Committee in Krasnodar launched a campaign to increase rice production in the region to one million tonnes by 1980. Officially it was named as the “battle for a

million tonnes of Kuban rice (Битва за миллион тонн кубанского риса)". The first full rice planting season using water from the reservoir was in 1976 which covered an area of 215 ,000 hectares of reclaimed and newly developed land. In a decade from 1965 to 1975, irrigated rice area in the Krasnodar region expanded from 40.7 thousand hectares by more than five times.

(The Kuban sea)

As a result of land reclamation works, rice cropped area in the Krasnodar region over the period 1966–1980 increased from 55,800 ha to 220,000 ha (out of 250,000 ha developed). Production increased from 192,000 tonnes to 1,008,000 tonnes. Average rice yields increased from 3.44 t/ha to 5.0 t/ha. During this period rice sown area increased by 3.94 times, production rose by 5.25 times, and average yield increased by 1.5 times.

Over the entire 50-year period from 1930 to 1980, arable land suitable for rice cultivation in the Krasnodar region increased from 57 ha to 250,000 ha which fits exponential growth at 18.26 percent per year. Similarly, production increased from about 100 tonnes to 1 million tonnes exponentially at 20.25 percent per annum. It was truly an agricultural/green revolution. But it wasn't labeled as such. It had a modest name, intensification of rice production in the Krasnodar region. How does it compare with the international Green Revolution in South Asia - India and Bangladesh? Over a 50-year period spanning from 1961 to 2011, average rice yield in India increased from 1.5419 t/ha (about the same in Krasnodar in 1930) to 3.5879 t/ha, a mere 2.3 times increase. Production during this period recorded an increase from 53,494,496 tonnes to 157,900,000 tonnes, a 2.95 times increase (FAOSTAT data). Similarly, in Bangladesh it took 50 years for average rice yields to almost double from 2.32 t/ha in 1972 to 4.64 t/ha in 2022.

Conclusion

In the past century, the quest to address food shortages and famines caused by poor harvests and frequent crop crop failures prompted governments in many countries of Europe, Americas and Asia to accelerate scientific plant breeding with the goal of developing high-yielding disease-resistant crop varieties focused on key food crops, wheat and rice. Those efforts gained momentum beginning in the 1920s and started spreading across continents through exchange of improved crop germplasm and enhanced collaboration among the plant scientists. In Russia and later in the Soviet Union in a different political and institutional context, these efforts also received strong government support. Almost at the same time, the international Green Revolution was spreading in Asia and America, intensification of wheat and rice production also occurred in the Soviet Union. But for political and ideological reasons, the label of the Green Revolution was avoided